NOTES ON THE SECOND HOUR EXAM

Spring 2015

The second hour exam will be held on Friday, April 17. As with all tests, it will be a closed note, closed book exam. Calculators and other electronic devices will not be allowed. I will provide a list of equations, results and formulae.The exam will cover :

• Vector calculus : Finding grad, div, curl in Cartesian and other coordinate systems; applying theorems of Gauss and Stokes; computing line integrals; determining whether forces are conservative; finding the scalar potential that generates a conservative force

• Orthogonal coordinates : Scale factors, unit vectors, determining expressions for the position vector in various coordinate systems; determining if a transformation is orthogonal; determining velocity and acceleration in orthogonal coordinate systems

• Series solutions of differential equation : finding recursion relations, determining coefficients and solutions to ODEs.

• Legendre series and polynomials : solving the Legendre differential equation, using generating functions to find recursion relations, expressing multipole potentials in terms of Legendre polynomials, expressing functions in Legendre series (series of Legendre polynomials)

• There will be a *Mathematica* problem on the exam: you will be asked to write a program to solve a differential equation using the Euler method and discretization techniques.